

FIG. 5 is a block diagram of a preferred embodiment of a recording and reproducing apparatus according to the present invention. The recording and reproducing apparatus may be an apparatus used by general users to record or reproduce desired multimedia contents.

Referring to FIG. 5, the recording and reproducing apparatus includes a controller 51, a recording/reading unit 52, a multiplexer 53, a digital interface 54, an encoder 55, and a decoder 56. Here, the digital interface 54 is for externally receiving or transferring a digital signal, for example, receiving or transferring multimedia data including main data (and additional data) through a network. The encoder 55 receives and encodes main data or additional data, and transmits the coded main data or additional data to the recording/reading unit 52. The recording and reproducing apparatus may include only the digital interface 54 or only the encoder 55 and the decoder 56 if necessary.

Here, the multiplexer 53, the encoder 55, and the decoder 56 have the same functions as those of the recording apparatuses and the reproducing apparatuses described above with reference to FIGS. 3 and 4. The recording/reading unit 52 has the functions of both the recording unit 32 of the recording apparatus described with reference to FIG. 3 and the reading unit 42 of the reproducing apparatus described with reference to FIG. 4. Also, the control unit 51 has the functions of both the control unit 31 of the recording apparatus and the control unit 41 of the reproducing apparatus. Therefore, explanations of the functions described above will not be repeated here.

Preferred embodiments of the recording and reproducing methods according to the present invention used by the recording and reproducing apparatuses which have the structures described above, will now be described.

FIG. 6 is a flowchart illustrating a preferred embodiment of a recording method according to the present invention. Referring to FIG. 6, when main data are input from the digital interface 34 or the encoder 35 of the recording apparatus, the recording unit 32 records the main data in the optical disc 300 (step 601). Next, sub data to be reproduced in synchronization with the main data are recorded in an area separated from the area where the main data have been recorded (step 602). Navigation information defining the relation between the main data and the sub data are recorded in the optical disc 300 (step 603). Here, the main data and the sub

data can be recorded simultaneously by alternation or in a predetermined sequential order.

FIG. 7 is a flowchart illustrating another embodiment of the recording method according to the present invention. Referring to FIG. 7, when main data are input from the digital interface 34 or the encoder 35 of the recording apparatus, the recording unit 32 records the main data (step 701). Next, sub data to be reproduced in synchronization with the main data are recorded in an area separated from the area where the main data have been recorded (step 702). Extra data are recorded in an area separated from the areas where the main data and the sub data have been recorded (step 703). Navigation information defining the relation between the main data, the sub data, and the extra data are recorded (step 704). Here, the main data, the sub data, and the extra data can be recorded simultaneously by alternation or in a predetermined sequential order.

FIG. 8 is a flowchart illustrating a preferred embodiment of a reproducing method according to the present invention. Referring to FIG. 8, the reading unit 42 of the reproducing apparatus or the recording/reading unit 52 of the recording and reproducing apparatus reads main data from the optical disc 400 or 500 (step 801). Next, sub data are read from an area separated from the area where the main data are recorded (step 802). The multiplexer 43 or 53 multiplexes the read main data and sub data (step 803). Here, necessary navigation information is read by the reading unit 42 or the recording/reading unit 52, and transmitted to the control unit 41 or 51, and then to the multiplexers 42 or 53 after being analyzed by the control unit 41 or 51. Alternatively, the navigation information read by the reading unit 42 or the recording/reading unit 52 can be transmitted directly to the multiplexer 43 or 53.

The multiplexed main data and sub data are output through the digital interface 44 or 54 (step 804), or are transmitted to and decoded by the decoder 46 or 56 (step 805). The decoded main data and sub data are transmitted to and reproduced through an output device such as a speaker, a monitor, or a printer.

FIG. 9 is a flowchart illustrating another embodiment of the reproducing method according to the present invention. Referring to FIG. 9, the reading unit 42 of the reproducing apparatus or the recording/reading unit 52 of the recording and reproducing apparatus reads main data from the optical disc 400 or 500 (step 901). Next, sub data are read from an area separated from the area where the main data are recorded (step 902). Extra data are read from an area separated from the

areas where the main data and the sub data are recorded (step 903). The multiplexer 43 or 53 multiplexes the read main data, sub data, and extra data (step 904). Here, necessary navigation information is read by the reading unit 42 or the recording/reading unit 52, and transmitted to the control unit 41 or 51, and then to the multiplexers 42 or 53 after being analyzed by the control unit 41 or 51. Alternatively, the navigation information read by the reading unit 42 or the recording/reading unit 52 can be transmitted directly to the multiplexer 43 or 53.

The multiplexed main data, sub data, and extra data are output through the digital interface 44 or 54 (step 905), or are transmitted to and decoded by the decoder 46 or 56 (step 906). The decoded main data, sub data, and extra data are transmitted to and reproduced through an output device such as a speaker, a monitor, or a printer.

FIG. 10 is a flowchart illustrating still another embodiment of the reproducing method according to the present invention. Referring to FIG. 10, the reading unit 42 of the reproducing apparatus or the recording/reading unit 52 of the recording and reproducing apparatus reads sub data from the optical disc 400 or 500 (step 1001). Next, extra data are read from an area separated from the area where the sub data are recorded (step 1002). The multiplexer 43 or 53 multiplexes the read sub data and extra data (step 1003). Here, necessary navigation information is read by the reading unit 42 or the recording/reading unit 52, and transmitted to the control unit 41 or 51, and then to the multiplexers 42 or 53 after being analyzed by the control unit 41 or 51. Alternatively, the navigation information read by the reading unit 42 or the recording/reading unit 52 can be transmitted directly to the multiplexer 43 or 53.

The multiplexed sub data and extra data are output through the digital interface 44 or 54 (step 1004), or are transmitted to and decoded by the decoder 46 or 56 (step 1005). The decoded sub data and extra data are transmitted to and reproduced through an output device such as a speaker, a monitor, or a printer.

As described above, the present invention provides a data storage medium in which different kinds of data constituting multimedia contents are recorded in discrete bitstreams for easy data editing or replacement, and a recording apparatus and method for the same. The present invention also provides an apparatus and method for simultaneously reading and reproducing multiple bitstreams.

It is expected that there will be more types of multimedia data services in the future to satisfy a variety of needs of users. A variety of multimedia contents will be